

REMARKS

The present application relates *inter alia* smectic liquid-crystal displays. Specifically, the invention of the current application provides a suitable chiral smectic liquid crystal mixture and a switching and display device comprising the suitable chiral smectic liquid-crystal mixture. The liquid-crystal mixture makes it possible, owing to monostable alignment with the ratio of the angle between the rubbing direction and the smectic layer normal to the tilt angle of at least 0.41, to achieve a very high contrast over a broad temperature range.

In order to provide the Examiner more time to consider the amendment to claim 12, Applicants have filed a RCE. Pursuant to the provisions of 37 C.F.R. §§ 1.17(a) and 1.136(a), Applicants petition the Director to extend the time period for Applicants to respond to the outstanding Office Action by three (3) months, i.e., up to and including November 3, 2004. A check for \$980.00 is enclosed with this paper. Applicants authorize the Director to charge any additional fee for consideration of this paper, or credit any overpayment, to Deposit Account No. 50-0320.

Claims 12-19 are pending. In order to advance prosecution and to make pending claims in condition for allowance, Applicants amended claim 12 and cancelled claim 19 without prejudice, admission, surrender of subject matter or intention of creating estoppels as to equivalents. Claim 12 is amended to delete alternative definitions of the ratio of the angle between the rubbing direction and the smectic layer normal to the tilt angle in the liquid crystal mixture. Applicants reserve the right to pursue the alternative definitions in a continuing application. Support for the amendments can be found on page 18 of the specification (see Example 3, table 9). Therefore, no new matter is present. Claim 19 is cancelled as it is drawn to

the nonelected subject matter. Applicants reserve the right to pursue this subject matter in a divisional application.

Claims 12-15 stand rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Mori et al. (U.S. 5,629,788, "Mori"), in view of Takatori et al. (U.S. 6,351,301, "Takatori") and Applicant's Admission of Prior Art (AAPA), and claims 16-18 stand rejected as being allegedly unpatentable over Mori, Takatori and AAPA in view of Fuss et al. (U.S. 5,547,605, "Fuss").

As none of these publications or alleged AAPA discloses monostable liquid crystal mixture with the ratio of the angle of at least 0.41, Applicants urge that the rejection does not establish a *prima facie* case of obviousness. Also, the Examiner is respectfully reminded that for the Section 103 rejection to be proper, both the suggestion of the claimed invention and the expectation of success must be founded in the prior art, and not Applicants' disclosure. *In re Dow*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988).

The rejection relies upon the teaching of Mori, which relates to a liquid crystal display which contains a chiral-smectic liquid crystal mixture. According to Mori, the liquid crystal mixture has at least two stable states whereas the liquid crystal mixture according to the present invention is monostable.

Furthermore, in the present invention, the angle Δ (see Figure 1 in the Examples) lies within the layer of the electrode layer if the rubbing direction lies in this layer as well. It is exactly the angle by which the symmetry known from the bistable FLC-displays is broken, i.e. the angle between the projection of the smecting layer normal 2 and the rubbing direction 1. The layers thus are also inclined, but not relative to the "vertical" field direction, but relative to the "horizontal" rubbing direction.

As described above, the angle relationship in Mori that is compatible with the Δ/Θ angle relationship of the present invention, is always exactly 0, i.e. the projections of the layer normal is exactly in rubbing direction, and the bistable states are symmetrically positioned on the left hand side and right hand side thereof. This is very different from the present invention wherein the ratio Δ/Θ is at least 0.41, i.e. the layer normal includes to one side by at least 0.41 times the tilt angle. Therefore, the direction configuration of the present invention is strongly asymmetric. It is because of these breaking of the symmetry that the liquid-crystal device of the present invention is able to achieve a monostable orientation (see page 12, second paragraph of the specification). Moreover, the monostable orientation of the present invention ensures that the memory-function is lost, but a continuous gray scale is obtained. The only stable state (projection of the director) is now in the rubbing direction.

Furthermore, the angle relations of δ/Θ of Mori have specific definitions which are very different from the angle relations of Δ/Θ according to the present invention. In Mori, δ defines the "layer leaning angle". This angle is defined as the angle between the smectic layer and the normal of the electrode plate (see Figures 3A and 3B). When looking through a FLC cell from below to above, i.e., in the field direction from electrode to the other electrode, the layer normals are not parallel to this view direction, but slightly inclined and not exactly vertical. Typical relations of δ/Θ are from 0.7 to 1.0.

Finally, Mori describes a transition which is symmetrical to a change of the polarity. In contrast, the transmission of present invention is asymmetrical to a change of polarity. As a result, there are no two bright states, but only one stable dark state and a continuum of bright states, allowing to adjust the brightness or transmission continuously. This leads to a very high

contrast over a broad temperature range, since a very low dark transmission of the LCD-cell is achieved to the excellent orientational properties (see specification, page 3, line 18 and 31).

The Examiner states that “nowhere in Applicant’s claimed invention is an “asymmetric” monostable mixture disclosed” (Office Action, page 6). Applicants respectfully disagree.

Applicants urge that according to Mori, the angle ratio is always exactly 0. This is in contrast to the present invention wherein the angle ratio is at least 0.41. Applicants believe that these data could suggest to one skilled in the art that the layer normal is inclined to one side by at least 0.41 times the tilt angle. Thus, Applicants urge that the angle ratio of at least 0.41 could suggest to a skilled artisan that the layer normal is inclined and thus the configuration of the monostable mixture is strongly asymmetric. Therefore, Applicants believe that a skilled artisan would recognize from the teachings of the instant invention that the claimed monostable liquid crystal mixture is “asymmetric”.

The Examiner further states that “ although Mori reference does not relate to a monostable chiral smectic liquid crystal mixture which is as a result of angle ratio values being larger than 0, it does, in fact, disclose a chiral smectic liquid crystal mixture in alignment, characterized in that the liquid crystal mixture has the phase sequence I-N-C and the angle p between the rubbing direction and the monostable position is at least 1° (see table 1). Clearly, Applicant’s use of the conjunction, ‘or’, in the claim language only requires either a ratio angle being at least 0.41 ‘or’ the phase sequence I-N-C being at least 1.”(Office Action at page 6).

Applicants respectfully urge that the position is now moot in view of the amendment of claim 1. In contrast, Mori only discloses displays in which the projection of the layer normal is exactly the rubbing direction, and the bi-stable states are symmetrically positioned on the left hand side and right hand side. Therefore, Applicants urge that Mori contains no pointer in the

direction of the present invention as now claimed, i.e. providing a monostable chiral-smectic liquid-crystal switching or displayed device having a ratio of the angle between the rubbing direction in the smectic layer normal to the tilt angle in the liquid crystal mixture of at least 0.41.

Neither Takatori nor the alleged AAPA, which discloses a nonstructured substrate combined with an active matrix substrate (see page 1, lines 20-23), remedy the above described deficiencies in Mori. Takatori relates to a smectic liquid-crystal which enables gray scale display and a liquid crystal using the same, see column 1, lines 5 to 12. The ferroelectric liquid-crystal display employs a mono-stable FLC having a half V-shaped switching mode. This mono-stable FLC having a half shaped switching mode has the correspondence in which brightness is changed only by one polarity of a voltage.

However, no where does Takatori mentions of the chiral smectic liquid-crystal mixture in monostable alignment having a ratio of the angle between the rubbing direction in the smectic layer normal to the tilt angle in the liquid-crystal mixture of at least 0.41, as provided for by the present claims. Moreover, in contrast to the present invention, which teaches only one stable dark state and a continuum of bright states, Takatori teaches only on bright state and accordingly, the maximum transmission is twice as high compared to the instant invention.

Accordingly, Takatori does not provide the requisite suggestion or motivation that would lead one of ordinary skill in the art to combine the teachings of Mori and AAPP with Takatori in order to practice the instantly claimed invention.

The Examiner further rejects claims 16-18 as allegedly being obvious over Mori, Takatori, AAPA in view of Fuss. For the reasons provided above, Applicants urge that Mori, Takatori and AAPA do not suggest the claimed liquid-crystal mixtures or liquid crystal displays according to the present invention and thus does not establish a *prima facie* case of obviousness.

Fuss does not remedy the inherent deficiencies of Mori, Takatori and AAPA as it relates to 2-aryloxytetrafluoropropionic esters, the process of their preparation and their use in liquid-crystalline mixtures. There is no requisite suggestion or motivation in Fuss that would allow one skilled in the art to practice the claimed chiral smectic liquid-crystal mixture in mono-stable alignments having the specific angel relationships that ensure high contrast over a broad temperature range as described in the present invention.

Thus, in view of the foregoing, it is urged that none of the prior publications, taken alone or in any fair combination suggests the present invention. None of the prior publications relied upon in rejection discloses the specific liquid crystal switching or display device of the instantly claimed invention. The instant invention, as claimed, discloses a specific liquid crystal switching or display mixture in a mono-stable alignment having a specific angle relationship. As discussed above, none of the prior publications taken in any fair combination suggests these claim elements. Thus, the rejection cannot establish a *prima facie* case of obviousness.

Further evidence of nonobviousness is the fact that the numerous advantages corresponding to the inventive liquid-crystal switching device (see page 3, last two paragraphs) are obtained by these claim elements. These advantages are not suggested in these prior publications. Accordingly, it is urged that the rejection does not establish a *prima facie* case of obviousness and withdrawal of this rejection is requested.

In view of the amendments and the remarks herein, this application is in condition for allowance. Favorable reconsideration of the application and prompt issuance of a Notice of Allowance are earnestly solicited.

Favorable action is earnestly solicited.

Respectfully submitted,

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